

WQB "Wide Aperture Quad" for Main Injector

20 October 2005, 9:00 AM

Club 157

Attendees: Rich Andrews, Weiren Chou, Hank Glass, Dave Harding, Dave Johnson, Vladimir Kashikhin, Ioanis Kourbanis, Bill Robotham

Measurements

Hank showed an additional analysis of the end field data, calculating the effective length of the magnet as a function of current. This is primarily of interest in understanding the behavior of the end field compared to the body field.

Hank also showed the data from the hysteresis study. The current ramps measured were exactly the same as were measured on one each IQB and IQC magnet. Presumably someone can extract the same useful information from them.

The only remaining measurement is the additional trim coil work. The plan is to establish a nominal state with hysteresis ramps between 150 A and 4000 A. Then at 200, 1000, 2800, and 3600 A we will run the trim coil from 0 to 50 A and back twice before moving to the next main coil current.

Hank showed some preliminary work on determining various harmonics that are not covered directly by the Morgan coil by using the feed down to measured harmonics. For example, b_3 (sextupole) as a function of x shows a clear cubic behavior, indicative of feed down from the allowed b_6 (12-pole). Using the best available values for the harmonics up to about b_{14} on center, the recreated field is very flat out to at least $\pm 1''$. Beyond that, the extrapolation becomes less reliable.

We also looked at the stretched wire scans. At 200 A and 2000 A the field deviates from a pure quadrupole by less than 10 units out to 50 mm and a little beyond. At 2800 A and 3600 A the good field region shrinks a little.

Hank will finish the off-center harmonics analysis and combine it with the SSW scans on a single plot.

It was agreed that the production measurement set would include exactly the same measurements as were done on the IQB/IQC/IQD magnets during the Main Injector production, but in addition to doing them on center, they would be repeated at $0.98''$, all using the long probe. This includes one excitation curve (up and down) with fairly finely spaced steps and harmonics at a smaller number of currents.

Design issues

It was agreed that the field uniformity is quite satisfactory and that we do not need to change the shape of the pole end pieces. The magnet integrated strength had already been declared fixed.

Fabrication

WQB001 is back in IB2 for its beam tube flanges, manifold protection, and final inspection.

WQB002 is in IB1 and will be the subject of the trim coil measurements. It needs the same finishing touches as WQB001.

WQB003 is in IB1 and needs the same finishing touches as WQB001.

WQB004 is still in IB2 waiting for the same finishing touches as WQB001.

WQB005 is welded up and being manifolded.

WQB006 is being assembled.

WQB007 has its main and trim coils wound.

WQB008 has two main coils and one trim coil wound.

WQB009 has not yet been started.

Now that the end has been settled, we can start buttoning up the magnets. After the magnet and the fabrication paperwork are complete, each magnet will go to MTF for a production measurement set. Although the data has already been taken on WQB001, having a set clearly identified as the production data will be very convenient.

Schedule

TD is aiming to have seven magnets fabricated and measured by the end of December. This is a slip since the last meeting due to the intervention of two crises with failed magnets in the accelerator complex (Booster extraction kickers and P-Bar pulsed dipole) that require urgent attention.

Next meeting will be 27 October 2005 at 9:00 in the Industrial Building 2 conference room.